

collecting the fresh and unbiassed opinions of eminent men in many walks of life, not only of artists, musicians, engineers, but eminent lawyers, judges, administrators, scholars, divines. No doubt it is possible that some of these classes would have failed to appreciate the necessity for answering the queries addressed to them, and the answers might have proved scanty; but, if obtained, the comparison must have afforded most interesting results.

Though I have spoken of Mr. Galton's conclusions as being in some degree disappointing, it ought not for a moment to be supposed that they are not worth the trouble incurred by the investigator and his correspondents. It is the extreme difficulty of the problem attacked which makes Mr. Galton's efforts seem less successful than some might have expected. The origin of genius or conspicuous success is the last thing which will be explained in the long progress of science. All that ought to have been expected was that Mr. Galton might form some comparative estimate of the several component tendencies which usually contribute to its production. If we look to practical conclusions, the inferences to be drawn from the answers concerning education are alone worth all the labour spent upon the book. The fact that about a hundred of the leading scientific men of the day are mostly in favour of a wide and varied range of studies in the school and college curriculum, seems to me a conclusion of great significance.

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GREEN'S "HISTORY OF THE ENGLISH PEOPLE."

A Short History of the English People. By J. R. Green, M.A., Examiner in the School of Modern History, Oxford. With Maps and Tables. (London: Macmillan and Co., 1874.)

WE deem this work to come within the province of a scientific journal for two reasons:—First, Mr. Green, so far as we know, is the first who, throwing aside with just contempt the "drum and trumpet" method of writing history, has attempted to trace the various influences or forces that have combined to mould the English people and make them what they are at the present day; second, because he has noticed in detail certain important episodes in the history of English science. The only work we know of that approaches in plan the history of Mr. Green is Knight's "Pictorial History of England;" but it is only on the surface that any resemblance exists. Knight's history is divided into sections, each of which deals with one of the various ways in which English energy has found scope—in politics and war, in literature and science, in commerce, agriculture, religion, and social life; but no attempt whatever is made to show the result of the combined influence of the forces acting and reacting through these departments on the English people as a whole. In reality, the distinction drawn between these various spheres of human energy is as arbitrary as the distinction between ancient and modern history; one might as well attempt to show the resultant of any number of physical forces, by attending separately to the action of each, without paying any heed to their action in combination. Mr. Green deserves all the credit due to the originator of a bold and happy idea, and still greater

credit for having worked out this idea with marvellous success. His history he calls a "short" one, but in the space of his 800 pages we venture to say he conveys a fuller and juster idea of the progress of the English nation than any previous author has done; nay, in very few instances has the whole life of any one period been more clearly and adequately set forth than will be found to be the case in these pages.

"At the risk," Mr. Green says in his preface, "of sacrificing much that was interesting and attractive in itself, and which the constant usage of our historians has made familiar to English readers, I have preferred to pass lightly and briefly over the details of foreign wars and diplomacies, the personal adventures of kings and nobles, the pomp of courts, or the intrigues of favourites, and to dwell at length on the incidents of that constitutional, intellectual, and social advance in which we read the history of the nation itself. . . . I have restored to their place among the achievements of Englishmen, the 'Faerie Queen' and the 'Novum Organum.' I have set Shakspeare among the heroes of the Elizabethan age, and placed the scientific inquiries of the Royal Society side by side with the victories of the New Model."

Mr. Green begins his history in "Old England," as he happily calls Sleswick, the fatherland of the English people; and with charming clearness and simplicity and well-sustained enthusiasm, traces step by step their ever-widening development from the time the original conquering colonists landed in Kent down to the present century. Mr. Green's power of discovering and bringing into bold relief the true causes of events, and of exhibiting in few and telling words the real characters of the multitude of actors that have played their busy parts on the restless stage of English history, is rare. We can only repeat that his work is the only existing history of England that has been written on anything like scientific principles.

Throughout his work Mr. Green gives prominence to the intellectual development of the people; in an interesting section on the Universities, in chap. iv. (1215—1217), in connection with the origin and growth of Oxford, a masterly sketch is given of the life and work of Roger Bacon, and the premature birth of English scientific research. Again, in a chapter on "the Revolution," a more detailed and thoroughly intelligent account is given of the scientific work of Francis Bacon, and of the "Beginnings of English Science," including the birth of the Royal Society. These sketches show that Mr. Green has not only mastered his authorities, but is also perfectly competent to trace the various stages by which science has attained its present all-important position. And, as the world progresses, historians of this class will be more and more in demand, for if things hold on in their present course, it will become more and more clearly recognised that the only satisfactory history of a people is the history of the growth of science, in its widest sense, among that people.

As an example of Mr. Green's method and style, we quote the paragraph, in connection with Francis Bacon, on the "Beginnings of English Science":—

"It was this lofty conception of the position and destiny of natural science which Bacon was the first to impress upon mankind at large. The age was one in which knowledge, as we have seen, was passing to fields of inquiry which had till then been unknown, in which Kepler and Galileo were creating modern astronomy, in

which Descartes was revealing the laws of motion, and Harvey the circulation of the blood. But to the mass of men this great change was all but imperceptible; and it was the energy, the profound conviction, the eloquence of Bacon, which first called the attention of mankind as a whole to the power and importance of physical research. It was he who by his lofty faith in the results and victories of the new philosophy nerved its followers to a zeal and confidence equal to his own. It was he who above all gave dignity to the slow and patient processes of investigation, of experiment, of comparison, to the sacrificing of hypothesis to fact, to the single aim after truth, which was to be the law of modern science. But, in England at least, Bacon stood—as we have said—before his age. The beginnings of physical science were more slow and timid there than in any country of Europe. Only two discoveries of any real value came from English research before the Restoration; the first, Gilbert's discovery of terrestrial magnetism in the close of Elizabeth's reign; the next, the great discovery of the circulation of the blood, which was taught by Harvey in the reign of James. But apart from these illustrious names, England took little share in the scientific movement of the Continent; and her whole energies seemed to be whirled into the vortex of theology and politics by the Civil War. But the war had not reached its end when a little group of students were to be seen in London, men 'inquisitive,' says one of them, 'into natural philosophy and other parts of human learning, and particularly of what hath been called the New Philosophy . . . which from the times of Galileo at Florence, and Sir Francis Bacon (Lord Verulam) in England, hath been much cultivated in Italy, France, Germany, and other parts abroad, as well as with us in England.' The strife of the time indeed aided in directing the minds of men to natural inquiries. 'To have been always tossing about some theological question,' says the first historian of the Royal Society, Bishop Sprat, 'would have been to have made that their private diversion, the excess of which they disliked in the public. To have been eternally musing on civil business and the distresses of the country was too melancholy a reflection. It was nature alone which could pleasantly entertain them in that estate.' Foremost in the group stood Doctors Wallis and Wilkins, whose removal to Oxford, which had just been reorganised by the Puritan Visitors, divided the little company into two societies. The Oxford society, which was the more important of the two, held its meetings at the lodgings of Dr. Wilkins, who had become Warden of Wadham College, and added to the names of its members that of the eminent mathematician, Dr. Ward, and that of the first of English economists, Sir William Petty. 'Our business,' Wallis tells us, 'was (precluding matters of theology and State affairs) to discourse and consider of philosophical inquiries and such as related thereunto, as Physick, Anatomy, Geometry, Astronomy, Navigation, Statics, Magnetism, Chymicks, Mechanicks, and Natural Experiments: with the state of these studies, as then cultivated at home and abroad. We then discoursed of the circulation of the blood, the valves in the *vena lactea*, the lymphatic vessels, the Copernican hypothesis, the nature of comets and new stars, the satellites of Jupiter, the oval shape of Saturn, the spots in the sun and its turning on its own axis, the inequalities and selenography of the moon, the several phases of Venus and Mercury, the improvement of telescopes, the grinding of glasses for that purpose, the weight of air, the possibility or impossibility of vacuities, and nature's abhorrence thereof, the Torricellian experiment in quicksilver, the descent of heavy bodies and the degree of acceleration therein, and divers other things of like nature.'

"The other little company of inquirers, who remained in London, was at last broken up by the troubles of the Second Protectorate; but it was revived at the Restora-

tion by the return to London of the more eminent members of the Oxford group. Science suddenly became the fashion of the day. Charles was himself a fair chemist, and took a keen interest in the problems of navigation. The Duke of Buckingham varied his freaks of rhyming, drinking, and fiddling, by fits of devotion to his laboratory. Poets like Denham and Cowley, courtiers like Sir Robert Murray and Sir Kenelm Digby, joined the scientific company to which in token of his sympathy with it the king gave the title of 'The Royal Society.'

The maps, and without maps no history ought to be tolerated, will be found greatly useful. Should Mr. Green utilise the large amount of material he must have collected for the purpose of writing a similar history on a much larger scale, no doubt he will say something about the physical environment of the English people,—those external conditions which have had their own share in shaping the history and character of our nation. His present work ought to become the school history of England.

FEHLING'S NEW CHEMICAL DICTIONARY

Neues Handwörterbuch der Chemie. Unter Mitwirkung von Bunsen, Fittig, Fresenius, &c. Bearbeitet und redigirt von Dr. Hermann v. Fehling, Professor der Chemie in Stuttgart. Erster Band. (Braunschweig: Druck und Verlag von Friedrich Vieweg und Sohn, 1874.)

TEN years have passed since the completion of the great work of Liebig, Poggendorff, and Wöhler, the "Handwörterbuch der Reinen und Angewandten Chemie." These years have witnessed great changes in our chemical knowledge; not only have theories which in the year 1864 occupied but an inferior place in the general system of chemistry now come to the front, but also a vast array of new facts demands a place in the system, which must therefore be extended so as to include them all.

The book which ten years ago was looked upon by all as a standard authority has now necessarily become somewhat antiquated, and the desire for a new edition has naturally arisen in the minds of the German chemists. The first fruits of this desire we have now in the goodly volume of 1,200 pages which lies before us.

As in most of the productions of the German mind, so in this, there is no lack of thoroughness, nor of breadth of view and treatment of the subject. The names of the contributors of the various articles are alone sufficient to inspire trust in what they have to tell us. A few of that old band of chemists who made the first *Handwörterbuch* famous still lend their aid to the success of the present volume; while among the younger men are Fittig, Kekulé, Hofmann, Victor Meyer, Tollens, Zincke, and others, who have already made for themselves a name in science.

Whether this be the proper time for the publication of a large and all-embracing treatise on chemistry is perhaps a question which admits of more than one answer. Chemical theories at present seem to be nearing that stage at which they are to be embraced within the larger theories of mechanical science. If this be true, the interpretation to be put upon chemical facts will in some years be greatly modified, and hence the publication of somewhat elaborate treatises will be demanded. In such a